

101069672 (5040)

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
27 December 2001 (27.12.2001)

PCT

(10) International Publication Number  
**WO 01/98868 A3**(51) International Patent Classification<sup>7</sup>: **G11B 5/09**,  
21/02, 5/60, 5/127, B32B 3/02

(21) International Application Number: PCT/US01/19944

(22) International Filing Date: 22 June 2001 (22.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/213,336 22 June 2000 (22.06.2000) US

(71) Applicant and

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Place, Columbus, OH 43209-2271 (US).(74) Agent: **GREENLEE, David, A.**; P.O. Box 340557,  
Columbus, OH 43234 (US).(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM,HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,  
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,  
MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL,  
TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF,  
CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

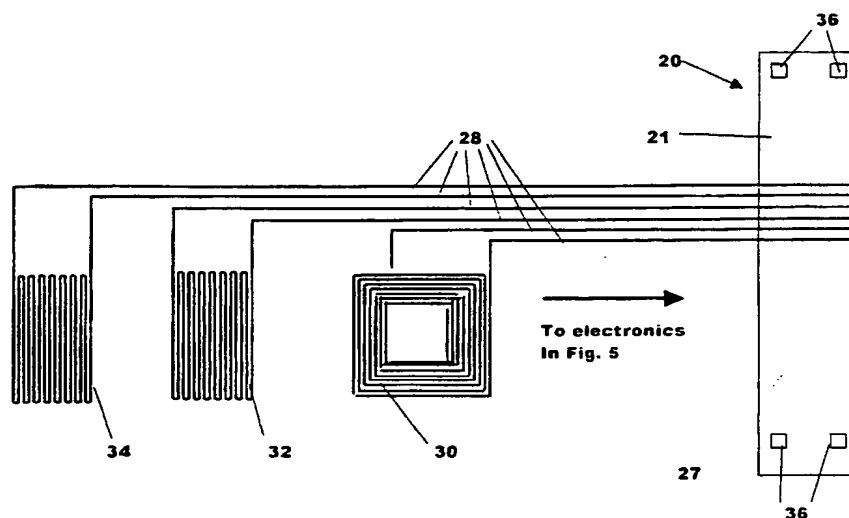
— of inventorship (Rule 4.17(iv)) for US only

Published:

— with international search report

(88) Date of publication of the international search report:

23 May 2002

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.(54) Title: **MASSIVELY PARALLEL FIXED HEAD DISK DRIVE****RECEIVED**

JUL 12 2002

Technology Center 2600

(57) **Abstract:** This invention provides an extremely high throughput magnetic disk drive which uses massively parallel architecture to achieve unprecedented sequential and random access transfer rates. The drive consists of a stationary magnetic head assembly (20) comprising a single integrated circuit (21) made of silicon along with the associated disk (24) and controller (81). This integrated circuit contains heads (22), amplifiers, buffers and circuits for verification of all disk operations. The head assembly operates on disks made of crystalline silicon to avoid problems of differential thermal contraction and to insure rigidity. It communicates with the host computer's random access memory by means of a novel and unique disk controller, which has the high capacity throughput to take advantage of the high throughput speed of this disk drive. The most important feature of this disk drive is that all disk tracks are processed (read or written) concurrently each time a given sector is available to the heads, which means that the entire disk can be read or written on each revolution.

WO 01/98868 A3

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/19944

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G11B 5/09, 21/02, 5/60, 5/127; B32B 3/02

US CL : 360/48, 75, 110, 234.4; 428/64.2, 65.3

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 360/48, 75, 110, 234.4; 428/64.2, 65.3

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
East

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                    | Relevant to claim No. |
|------------|-------------------------------------------------------------------------------------------------------|-----------------------|
| Y          | US 5,781,376 A (TSUKAMOTO) 14 July 1998 (14.07.1998), see abstract                                    | 1-8, 12, 19, 20       |
| Y          | US 5,487,931 A (ANNAcone et al) 30 January 1996 (30.01.1996), col. 4 lines 47-60, col. 9 lines 53-58. | 1-8, 12, 19, 20       |
| Y          | US 6,045,901 A (HASHIMOTO et al) 04 April 2000 (04.04.2000), col. 5 lines 31-39.                      | 2                     |
| Y          | US 5,720,861 A (KANEKO et al) 24 February 1998 (24.02.1998), col. 4 lines 16 - 58.                    | 1-3                   |
| X          | US 5,898,499 A (PRESSESKY) 27 April 1999 (27.04.1999), col. 4 lines 1-24                              | 13-17                 |
| ---        |                                                                                                       | 8                     |
| Y          |                                                                                                       |                       |
| X          | US 5,920,447 A (SAKATA et al) 06 July 1999 (06.07.1999), abstract                                     | 9-11                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

09 September 2001 (09.09.2001)

Date of mailing of the international search report

15 JAN 2002

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Regina Neal

Telephone No. (703) 305-2700

*For*  
*Rugenia Zagan*

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

**RECEIVED**  
JAN 22 2002

To:  
DAVID A. GREENLEE  
P.O. BOX 340557  
COLUMBUS, OH 43234

DAVID A. GREENLEE

**PCT**

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)

|                                                    |                                                                            |
|----------------------------------------------------|----------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>30533 PCT | Date of Mailing<br>(day/month/year) <b>15 JAN 2002</b>                     |
| International application No.<br>PCT/US01/19944    | International filing date<br>(day/month/year)<br>22 June 2001 (22.06.2001) |
| Applicant<br>MAYER, DAVID F.                       |                                                                            |

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.  
 Filing of amendments and statement under Article 19:  
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompany sheet.

Where? Directly to the International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland  
 Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau.  
 If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

|                                                                                                                                                      |                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703)305-3230 | Authorized officer <i>For</i><br>Regina Neal<br>Telephone No. (703) 305-2100 |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|

Form PCT/ISA/220 (July 1998)

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                    |                                                                                  |                                                                                                                                     |
|----------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>30533 PCT | <b>FOR FURTHER<br/>ACTION</b>                                                    | see Notification of Transmittal of International Search Report<br>(Form PCT/ISA/220) as well as, where applicable, item 5<br>below. |
| International application No.<br>PCT/US01/19944    | International filing date ( <i>day/month/year</i> )<br>22 June 2001 (22.06.2001) | (Earliest) Priority Date ( <i>day/month/year</i> )<br>22 June 2000 (22.06.2000)                                                     |
| Applicant<br>MAYER, DAVID F.                       |                                                                                  |                                                                                                                                     |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the Report**

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 2



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/19944

## Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

### NEW ABSTRACT

This invention provides an extremely high throughput magnetic disk drive which uses massively parallel architecture to achieve unprecedented sequential and random access transfer rates. The drive consists of a stationary magnetic head assembly (20) comprising a single integrated circuit (21) made of silicon along with the associated disk (24) and controller (81). This integrated circuit contains heads (22), amplifiers, buffers, and circuits for verification of all disk operations. The head assembly operates on disks made of crystalline silicon to avoid problems of differential thermal contraction and to insure rigidity. It communicates with the host computer's random access memory by means of a novel and unique disk controller, which has the high capacity throughput to take advantage of the high throughput speed of this disk drive. The most important feature of this disk drive is that all disk tracks are processed (read or written) concurrently each time a given sector is available to the heads, which means that the entire disk can be read or written on each revolution.

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| ---        |                                                                                                       | 8                     |
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*Rugenia Zogor*